FOREST PRODUCTS
Project Fact Sheet

GAS CLEANUP FOR COMBINED-CYCLE SYSTEMS

BENEFITS

- Simplifies the gas cooling and cleaning operation
- Eliminates waste water and the waste water treatment system from the plant
- Avoids the permitting requirements for a waste water stream
- Removes potentially hazardous compounds from the system, saving 10% in capital costs and >15% in operating costs
- Increases plant reliability
- Offers additional options for heat recovery from the system
- Leads to a more efficient gasification/gas turbine combined cycle system

APPLICATIONS

The approach to gas cleanup defined by this experiment will help further the use of advanced gas turbines as the power system in pulp and paper mills.

Methods That Control Contaminant-Free Fuel Gas System Will Help Implement Advanced Turbine Technology in Mills

The gasification of biomass fuels improves the amount of power available in the fuels by 10 to 15 percent. However, inorganic particulates and condensible organic materials must be removed from the gas to make it suitable for use in advanced gas turbine systems, such as those used to generate power in pulp and paper mills. This project will focus on developing a low-cost disposable catalyst system to remove these contaminants and to eliminate the waste water treatment system associated with ordinary combined cycle operations.

Researchers will build on efforts already underway at Battelle and the National Renewable Energy Laboratory (NREL) and will integrate their proof-of-concept gasification facility at a utility in Vermont that presently uses wood as a source of fuel. Although the results will be advisory in nature, they are expected to demonstrate the potential for significantly increasing the amount of power that can be generated from a given amount of biomass resources. By increasing the efficiency and economy of operating an integrated gasification combined cycle system, pulp and paper mills will be able to lower their costs significantly. They will also find it easier to permit their facilities because of the elimination of hazardous waste streams.

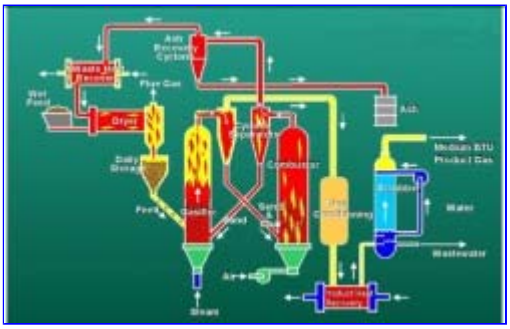

Figure 1. The schematic shows the Battelle/Future Energy Resources Corporation (FERCO) High Throughput Gasification Process. (FERCO is the licensee of the Battelle gasification technology.)

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PROJECT DESCRIPTION

Goal: To advance the cleanup of gas produced by gasification of biomass resources so it is suitable for use in high-efficiency gas turbines, and to eliminate certain hazardous waste streams ordinarily associated with gas cleanup.

The project will be a gated approach to experimentation and system development in Battelle's existing Process Research Unit (PRU). Results will be confirmed on a slip stream at a Burlington, Vermont, proof-of-concept commercial site. Finally, the cleaning system will be scaled up to process the complete gas stream in the Vermont gasifier as it is integrated with a gas turbine combined-cycle system.

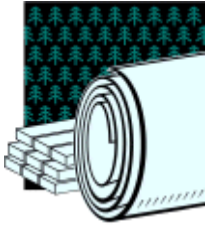
The effort will be divided into four phases:

- Phase 1: Design cleanup system to remove particulates and install in Battelle's PRU gasification facility (approximately 20,000 standard ft3/hr.).
- Phase 2: Evaluate performance of catalyst system using measurements from transportable molecular beam mass spectrometer (TMBMS).
- Phase 3: Install and operate the modified system for extended periods as a slip stream reactor at a commercial-scale demonstration facility (200 tons/day) at a utility in Vermont.
- Phase 4: Design and install a full-scale system on the Vermont utility's gasifier to provide cleaned gas for its gas turbine or for a pulp mill.

PROGRESS & MILESTONES

The following technical issues are related to success criteria:

- Extending life of the catalyst so it requires replacement only once per year
- Incorporating particulate removal into the design of the reactor and minimizing heat loss and pressure drops associated with operating the filter
- Removing condensed organic compounds to a level of < 50 ppm for each component, or to a level that eliminates waste water treatment
- Reacting and removing condensible inorganic material to eliminate deposits on turbine blades
- Achieving a minimum gaseous hourly throughput velocity of 3000 ft^3/hr



PROJECT PARTNERS

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